

and that of their mixtures. The materials were applied as contact insecticides in refined kerosene on the Campbell turntable. The house fly (*Musca domestica* L.) was used as the test insect.

The *dl-trans* fraction of allethrin was 1.56 as toxic as the *dl-cis* fraction. The toxic action of the two fractions when applied in mixtures was identified as similar action.

The *trans* fraction was 1.33 and the *cis* fraction 0.85 as toxic as the sample of allethrin used. On this basis the *cis* isomers comprised about 69 percent and the *trans* isomers about 31 percent of allethrin.

A crystalline compound separated from the *trans* fraction was only 0.35 as toxic as allethrin and constituted 8 percent of that insecticide. The remainder of the *trans* fraction was 1.69 as toxic as allethrin and constituted 23 percent of that insecticide.

It is deduced that half of each portion of the *trans* fraction is relatively nontoxic and that, of the remaining two isomers, *d-trans* acid with *d*-allethrolone and *d-trans* acid with *l*-allethrolone, one is 0.70 and the other 3.38 as toxic as allethrin.

All the separated constituents possessed high knockdown value.

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PALEONTOLOGY.—*New species of Lecanocrinus*. HARRELL L. STRIMPLE, Bartlesville, Okla. (Communicated by Alfred R. Loeblich, Jr.)

Much of the material used in the present study has been made available through the generosity of Drs. G. A. Cooper and A. R. Loeblich, of the U. S. National Museum, and Richard Alexander, at present a student at the University of Oklahoma. One rare specimen from the Haragan formation was collected by Mrs. Beverley Graffham on the occasion of the first field trip by herself and her husband, Allen Graffham, to the old Hunton town site under the guidance of Richard Alexander. Numerous specimens from the Henryhouse formation have been

collected by the author and his wife, Mrs. Melba Strimple.

The three most distinctive forms of *Lecanocrinus* found in the Henryhouse formation are described as new species: *L. brevis*, *L. erectus*, and *L. invaginatus*. One form from the Brownsport (Lobelville) formation is described as *L. lindenensis*, n. sp. The Haragan form is described as *Lecanocrinus hunttonensis*, n. sp.

Abbreviations are given in the first systematic description below and are used thereafter without explanation.

Genus *Lecanocrinus* Hall
Lecanocrinus brevis, n. sp.
 Figs. 13-17

Dorsal cup broad, robust, bowl-shaped, with shallowly concave base. Lower portions of basals (BB) as well as the three infrabasals (IBB) occupy the basal concavity. BB are five large plates which reach a height of 5.7 mm above the basal plane of the cup. Radials (RR) are five broad pentagonal plates which curve sharply inward before contacting the first primibrachials (PBrBr). The general contour of each radial plate is more or less flattened, whereas most species referred to the genus have gentle to strong curvature. Two low ridges and subsequently formed grooves pass from each basal to the adjoining radials. Adsutural areas of BB and RR are slightly raised, which condition continues onto the arms. Posterior interradius (post. IR) is occupied by a rather large, obliquely placed radianal (RA) and a broad anal X. The area about and including RA is strongly protruded. Conversely, anal X is sharply depressed in upper midsection. Anal X has a broad contact with posterior basal (post. B) and has very irregular lateral sides, particularly near the summit where right and left posterior radials and arms are endeavoring to regain width, which is lost in proximal portions to the large anal plates. The right posterior is the more successful in this respect and develops next to the largest arm of the crown.

The broad arms form a completely closed dome over the body cavity. Those of the right posterior, right anterior, and left anterior are broader and longer than the anterior and left posterior. This condition is reflected in the width of the RR with the exception of the right posterior where additional width is gained by encroachment upon the right distal edge of anal X. The left anterior ray is the most dominant, and the right anterior is slightly smaller than that of the right posterior. First bifurcation takes place with the second primibrachials in all rays; however, in the holotype it is the third primibrachial (PBr) that is axillary. The lateral edges of all arms are raised to form low ridges. In all rays except the anterior there is normally a second bifurcation with the third or fourth secundibrachials.

Surface ornamentation is absent other than previously noted ridges and grooves. The proximal columnals are round and small.

Measurements (in mm).—

	<i>Holotype</i>
Height of crown	22.0
Height of dorsal cup	6.9
Maximum width of cup	23.1
Width of cup at summit (anterior to posterior)	22.7
Maximum width of IBB circlet	8.0
Length of r. ant. B	10.5*
Width of r. ant. B	10.5*
Length of r. ant. R	8.9*
Width of r. ant. R	13.5*
Length of RA	7.2
Width of RA	6.9
Length of anal X	10.9
Maximum width of anal X	8.1

* Measurements taken along curvature of plates.

Remarks.—Among described species of the genus, only two are reported to have a strong tendency toward development of raised ridges. These are *L. angulatus* Springer (1920) and *L. bacchus* (Salter) (1873), which both have upflared IBB, readily visible in side view of the dorsal cup. *L. soyei* Oehlert (1882) has an outline of dorsal cup comparable to that of *L. brevis*. It is a smaller species of lower Devonian age having a strongly granular surface.

The broad bowl-shaped dorsal cup and the unusual ridges and grooves are sufficiently distinctive to separate *L. brevis* from other known species.

Occurrence.—Upper Henryhouse formation, Silurian; holotype collected by Richard Alexander, NW/4 SW/4 section 4, T. 2 N., R. 6 E., paratype SW/4 NW/4 NW/4 section 33, T. 3 N., R. 6 E., two paratypes (crowns) collected by A. R. Loeblich, Jr., and W. E. Ham near the center NE/4 SW/4 section 10, T. 2 N., R. 6 E., one paratype collected by Melba Strimple in NW/4 SW/4 section 4, T. 2 N., R. 6 E., all in Pontotoc County, south of Ada, Okla.

Types.—To be deposited in the U. S. National Museum.

Lecanocrinus erectus, n. sp.

Figs. 9, 10

This species, known from specimens having complete dorsal cups and the first few brachials of the arms, is one of the largest observed in the Henryhouse formation. Three IBB form a flattened base, mildly impressed in midsection for reception of the proximal columnals. Distal portions of IBB are upflared and are readily visible in side view of the cup. Expansion of the cup is rather rapid to above midheight, thereafter it is slowly expanded to just below distal extremity

where there is a mild constriction. Above the IBB circlet, there are five BB, five large RR, one RA and one anal X. The radials are irregular in width and have somewhat flattened profiles. In the holotype, that of the right posterior has a width of 11.7 mm; right anterior, 13.6 mm; anterior, 11.8 mm; left anterior, 15.4 mm; and left posterior, 11.2 mm. RA is small and has the form of a regular quadrangle. Anal X is large and elongated and extends only a short distance above the cup summit. Raised ridges originate in the center of each basal and pass to adjoining radials where they meet just above midheight of the plates. In the post. IR, additional ridges are found. A third ray passes from r. post. R to RA and continues onto anal X. The right ray of post. B passes to anal X and a third ray passes to RA and continues onto r. post. R. In addition to the above ridges, there is a swelling along the sutures just above midheight of the RR. The area about and including the RA is protruded. Median portion of anal X is decidedly concave. Both r. post. and l. post. RR sacrifice width to the anal plates, but near the summit of the cup they regain a large portion of their width at the expense of anal X.

First primibrachials are low, wide elements; the second PBrBr are low and axillary. In the holotype, the right and left posterior axillary PBrBr have no posterolateral sides but have normal lateral sides to the anterior. This arrangement would allow first and second SBrBr to contact the distal extremity of anal X. Articulating facets of the radials and brachials are very restricted in length. A tendency toward swelling has been noted in proximal portions of the lateral sides of brachials, indicating raised ridges comparable to those found in *L. brevis*.

Measurements (in mm).—

	Holotype	Paratype
Height of dorsal cup.....	16.1	16.0
Maximum width of dorsal cup.....	22.3	23.3
Height of IBB above basal plane.....	?	2.0
Height of BB above basal plane.....	9.0	10.5
Maximum width of IBB circlet.....	8.0	9.6
Length of r. ant. B.....	9.5*	10.3*
Width of r. ant. B.....	10.0*	10.3*
Length of r. ant. R.....	9.6*	10.0*
Width of r. ant. R.....	13.6*	14.0*
Length of RA.....	6.0	6.4
Width of RA.....	6.0	5.1
Length of anal X.....	11.2	9.8
Maximum width of anal X.....	8.8	6.7

* Measurements taken along curvature of plates.

Remarks.—This species appears to be more closely related to *L. brevis* than other described

species; however, the general outline of the cup is somewhat comparable to that of *L. soyeyi* (Oehlert) (1882). The later is a lower Devonian species of small size and has a decidedly granular surface. In *L. brevis* the ridge like structures are doubled and adjacent grooves are present. The tendency toward swelling along sutures is more widespread in *L. brevis* but is nevertheless found in the upper portion of the cup in *L. erectus*. The two species are quite different in shape of cups.

Occurrence.—Upper Henryhouse formation, Silurian; holotype and one paratype collected by Richard Alexander in SW/4 NW/4 NW/4 section 33, T. 3 N., R. 6 E., measured paratype by A. R. Loeblich, Jr., in exposure along east side of road in bluff NW/4 SW/4 section 4, T. 2 N., R. 6 E., Pontotoc County, south of Ada, Okla.

Types.—To be deposited in the U. S. National Museum.

***Lecanocrinus lindenensis*, n. sp.**

Figs. 5-8

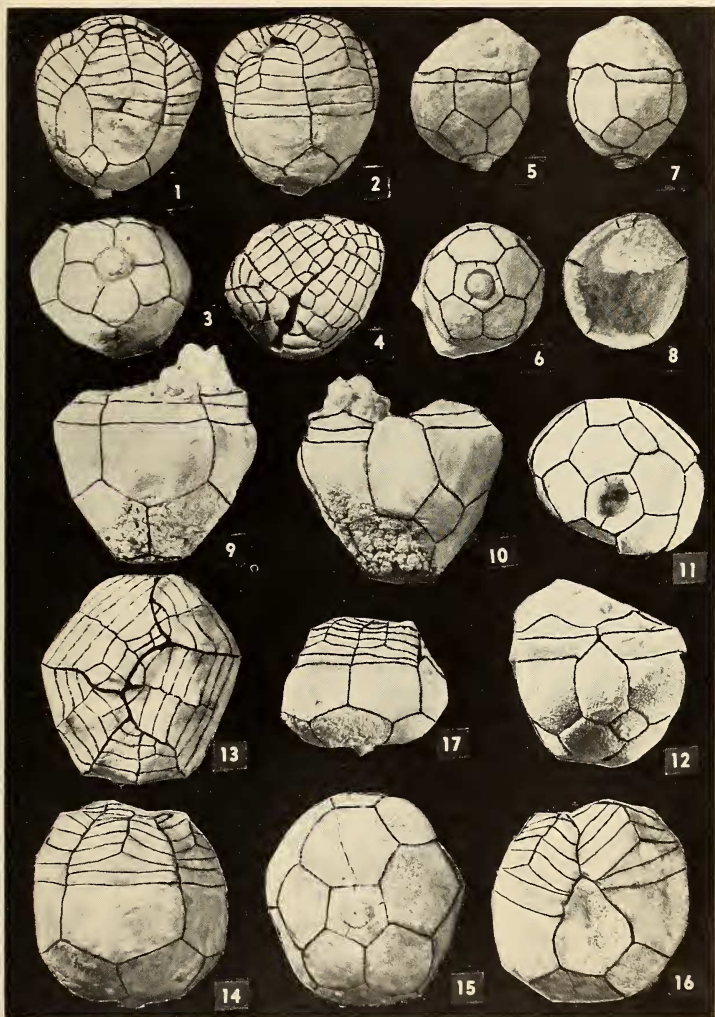
The large dorsal cup is turbinate-shaped with upflared IBB visible in side view of cup. The surface is mildly granular and sutures are slightly impressed. Five BB are of equal width and height. Five RR are only slightly wider than high. RA is a small quadrangular plate, obliquely placed at the lower right hand corner of the long anal X. Anal X has an even width within the cup and extends a short distance into the interbrachial area where it terminates in a point. There is a slight depression just below the termination, smaller but similar to that found in *L. brevis* and *L. erectus*. First primibrachials are nonaxillary and are very low elements.

Measurements (in mm).—

	Holotype
Height of dorsal cup.....	8.9
Maximum width of cup.....	13.2
Height of IBB above basal plane.....	0.9
Maximum width of IBB circlet.....	4.6
Height of BB above basal plane.....	4.6
Length of r. ant. B.....	5.7*
Width of r. ant. B.....	5.7*
Length of r. ant. R.....	6.4*
Width of r. ant. R.....	8.2*
Length of RA.....	3.1
Width of RA.....	3.4
Length of anal X.....	6.2
Maximum width of anal X.....	4.4

* Measurements taken along curvature of plates.

Remarks.—The elongated cup with mildly granular surface, slight constriction at summit, and upflared IBB of *L. lindenensis* provides differentiation from other described species. Elongated



FIGS. 1-4.—*Lecanocrinus invaginatius*, n. sp.: Holotype viewed from right posterior, anterior, base, and summit (posterior at top), $\times 1.6$. FIGS. 5-8.—*Lecanocrinus tindenensis*, n. sp.: 5-7, Holotype viewed from anterior, base (posterior at top), and right posterior, $\times 1.6$; 8, paratype viewed from summit (posterior at top), $\times 1.6$. FIGS. 9, 10.—*Lecanocrinus erectus*, n. sp.: Holotype viewed from anterior and posterior, $\times 1.6$. FIGS. 11, 12.—*Lecanocrinus hintonensis*, n. sp.: Holotype viewed from base and posterior, $\times 2$. FIGS. 13-17.—*Lecanocrinus brevis*, n. sp.: 13-16, Holotype viewed from summit (posterior at top), anterior, base, and posterior, $\times 1.6$; 17, paratype viewed from left posterior, $\times 1.4$.

RR and somewhat prominent BB suggest affinity with *L. fasciatus* (Angelin) (1878), and *L. hunttonensis*, n. sp. The former species apparently has no tendency toward constriction at the summit of the cup and the anal plate is almost entirely within the dorsal cup. The later species has more pronounced surface ornamentation, more acute termination of anal plate, more deeply impressed sutures, and IBB not visible in side view of cup.

L. erectus is a larger species with somewhat comparable cup outline if angulation is disregarded. It is different in that radial plates are proportionately wider, there is no surface granulation, impressed sutures are absent and the RR are more irregular in width in *L. erectus*.

Occurrence.—Brownsport (Lobelville) formation, Silurian; holotype and three paratypes collected by A. R. Loeblich in road cuts on north side of Short Creek, North-central Rectangle, Linden Quadrangle, TVA 32 SE, east of Linden, Tenn.

Types.—To be deposited in U. S. Nat. Museum.

***Lecanocrinus invaginatus*, n. sp.**

Figs. 1-4

Dorsal cup truncate bowl-shaped with concave base. IBB are restricted to the basal invagination. BB are five normal plates having width equal to length except where affected by the additional plates of the posterior interradius. RR are pentagonal and only slightly wider than long. RA is very small, quadrangular and is obliquely placed at the lower right corner of anal X. Anal X is unusually long and narrow. There is no tendency toward strong tumidity, raised ridges or impressed sutures in the dorsal cup.

The arms are broad and occupy an area almost equal to that of the dorsal cup. In the holotype, first bifurcation takes place with the second PBrBr in all rays except the left posterior, wherein the first PBr is axillary. In the larger rays of the right posterior, right anterior and left anterior there is another bifurcation with the second secundibrachials in all rays. Yet another branching occurs in the inner rays only of the left anterior rami on the third tertibrachials (TBrBr). In the arms of the right posterior only, the right rami are long enough to accommodate more than three brachials above the second dichotomy and the third TBr of the inner ray is axillary. The rami of the right anterior, anterior and left posterior terminate with the third TBrBr.

Measurements (in mm).—

	<i>Holotype</i>
Height of crown	18.2
Height of dorsal cup	19.1
Maximum width of dorsal cup	16.4
Maximum width of cup at summit	16.4
Length of r. ant. R	6.3*
Width of r. ant. R	9.0*
Length of r. ant. B	6.6*
Width of r. ant. B	6.5*
Length of RA	2.6
Width of RA	2.6
Length of anal X	7.0
Maximum width of anal X	5.2
Height of BB above basal plane	6.9

* Measurements taken along curvature of plates.

Remarks.—*L. invaginatus* appears to be comparable to *L. pusillus* (Hall) (1863) and *L. pisi-formis* (Roemer) (1860). The concave nature of the basal area most readily distinguishes it from those species as well as the narrow, elongated nature of the anal X. *L. meniscus* Springer (1920), has a broad base with IBB covered by the proximal columnals, but the sutures of that species are sharply impressed and the mode of arm branching is different above the first dichotomy.

Occurrence.—Upper Henryhouse formation, Silurian; Holotype and one paratype collected by the author in the NE/4 SW/4 section 10, T. 2 N., R. 6 E., Pontotoc County, south of Ada, Okla.

Types.—To be deposited in the U. S. National Museum.

***Lecanocrinus hunttonensis*, n. sp.**

Figs. 11-12

Dorsal cup truncate bowl shaped. Three unequal IBB form a small subhorizontal basal platform, the median portion of which is sharply depressed. The smaller IB is right posterior in position. Five BB are rather small, hexagonal except in the posterior interradius where additional facets are necessary for reception of the two anal plates. Five RR are large, long, pentagonal plates. RA is a small quadrangular element in oblique position to the lower right of anal X which plate is long with even width and an acute distal termination. Sutures of cup plates are impressed.

Fragmentary portions of the arms consist of low nonaxillary PBrBr in all rays except the anterior which is missing from the IBB circlet upward. In the right and left posterior there are low axillary second PBrBr and a few secundibrachials.

The entire surface of this specimen is covered by medium pustules which tend to become confluent and form minute ridges.

Measurements (in mm).—

	<i>Holotype</i>
Height of dorsal cup.....	7.1
Maximum width of cup.....	11.7
Maximum width of cup at summit.....	11.3
Maximum diameter of IBB circlet.....	3.7
Length of r. ant. B.....	5.0*
Width of r. ant. B.....	5.0*
Length of r. ant. R.....	5.5*
Width of r. ant. R.....	6.7*
Length of RA.....	2.2
Width of RA.....	1.8
Length of anal X.....	4.7
Maximum width of anal X.....	3.2
Height of BB above basal plane.....	3.7

* Measurements taken along curvature of plates.

Remarks.—*L. fasciatus* (Angelin) has an appearance more comparable to *L. huntonensis* than other described species. It differs in lacking constriction at the summit of the dorsal cup and in restriction of anal X to the cup. Anal X in

L. huntonensis extends well into the interbrachial area, although it does not pass above the first PBrBr. *L. invaginatus* has a somewhat comparable appearance, particularly in the elongate nature of the RR plates, but other characters are quite different.

The surface ornamentation of the present species is distinctive from that of other described species.

Occurrence.—Lower portion of the Haragan formation (about 15 feet above the *Camarocrinus* zone), Devonian; collected by Mrs. Beverly Giffham near Hunton townsite, west of Clarita, Okla.

Type.—Deposited in the U. S. National Museum.

REFERENCES

All cited references are to be found in BASSLER, R. S., and MOODEY, MARGARET W. *Bibliographic and faunal index of Paleozoic Pelmatozoan Echinoderms*, Geol. Soc. Amer. Special Publ. 45. 1943.

BOTANY.—*A new species of Sphaceloma on magnolia.* ANNA E. JENKINS, U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering, and JULIAN H. MILLER, University of Georgia.

A technical description of the new species of *Sphaceloma* on *Magnolia grandiflora* L.¹ is here provided as follows:

Sphaceloma magnoliae n. sp.

Fig. 1

Spots on upper leaf surface, not visible below, few to almost innumerable, scattered or localized, often concentrated along midrib and on marginal and apical areas, circular to irregular, often up to 1.5 mm in diameter, gray ("pale mouse gray"),² with a brown ("sorghum brown") margin, slightly raised, coalescent, sometimes discoloring much of the upper leaf surface except basal area; leaf tissue in marginal and apical region sometimes killed, then noticeably brown ("snuff brown") below; acervuli, numerous, epiphyllous, arising intraepidermally, erumpent, black, generally with a hyaline prosenchymatic base, 20–40 μ in diameter, 12–24 μ thick; palisade of conidiophores 12–16 μ thick; conidiophores characteristically awl-shaped, continuous or 1-septate; conidia not seen on the acervuli.

¹ JENKINS, A. E. *Sphaceloma causing scab of Magnolia grandiflora*. Abst. Phytopathology **33**: 6. 1943.

² RIDGWAY, R. *Color standards and color nomenclature*. 45 pp., 42 pls. Washington, 1912.

Elsinoë stage in process of development.

Maculae epiphyllae, sparsae ad numerosissimae conspersae, saepe aggregatae vel confluentes, sub-elevatae, circulares vel subcirculares, usque 1.5 mm in diam., griseae, margine brunneo circumdatae, ex acervulis atro punctatae; acervuli intraepidermales, dein erumpentes, compacti, usque 40 μ in diam. et 12–24 μ crassi; conidio phora obscura, continua vel 1 septate, usque 16 μ , stromate pallido oriunda; conidia non visa.

Distribution.—Producing the disease termed "magnolia scab" on leaves of *Magnolia grandiflora* (Magnoliaceae) in Florida, Georgia, Louisiana, and Mississippi. The disease was abundant in Georgia in 1941–1943, in some cases causing severe leaf fall. More recently its attack appears to have been less harmful.

Specimens examined.—As follows³:

FLORIDA:

Vic. Century, Aug. 5, 1943, W. B. Tisdale.

³ USM = Mycological Collections of the Bureau of Plant Industry, Soils, and Agricultural Engineering, Plant Industry Station, Beltsville, Md. IB = Herbarium, Seção de Fitopatologia, Instituto Biológico, São Paulo, Brazil.

MSE = Jenkins - Bitancourt, Myriangiales selecti exsiccati.